H. ROWNTREE.

DOOR OPERATING MECHANISM.

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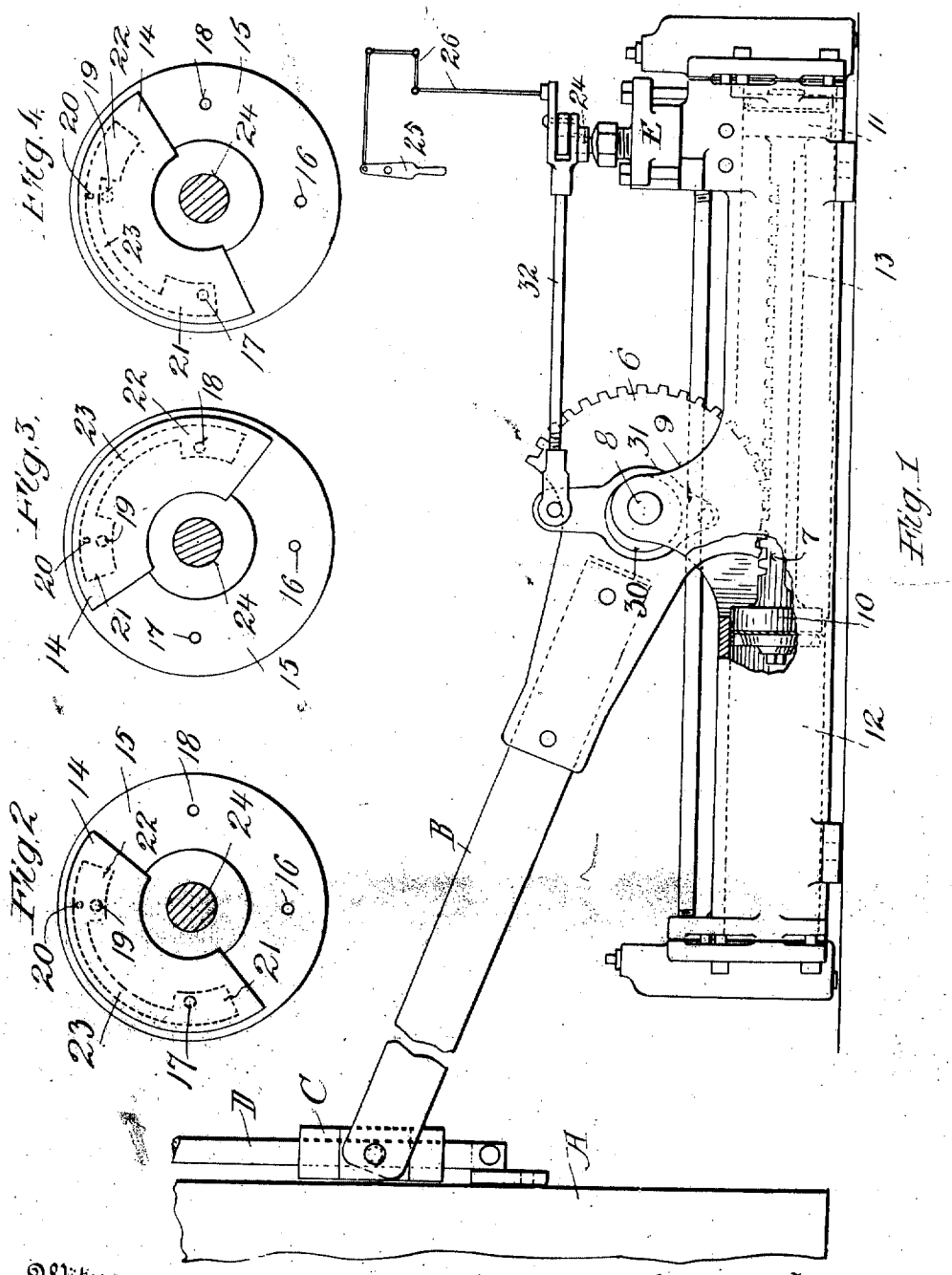
1,001,989. Patented Aug. 29, 1911.



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DOOR-OPERATING MECHANISM.

1,001,989. Specification of Letters Patent. **Patented Aug. 29, 1911.**

Application filed April 22, 1909. Serial No. 491,516.

To all whom it may concern:

Be it known that I, HAROLD ROWNTREE, a citizen of the United States, residing at Chicago, county of Cook, and State of Illinois, have made a certain new and useful Invention in Door-Operating Mechanism, of which the following is a specification.

This invention relates to door operating mechanism and particularly to mechanism operated by fluid pressure, as, for instance, compressed air.

The object of the invention is to provide means which are simple and inexpensive for operating doors pneumatically, and wherein efficient control of the operating mechanism is secured and maintained.

A further object is to provide pneumatic door operating means employing associated operating cylinders and pistons and wherein the operating pressure is applied to equal piston areas whether the door is moved in one direction or the other.

A further object of the invention is to provide a pneumatic door operating mechanism employing associated cylinders and pistons and wherein each piston is exposed to the atmospheric pressure on one side, and the entire piston area on the other side is exposed to the operating medium when such medium is admitted to the cylinder for operating the door.

A further object is to provide a construction employing connected pistons with means for controlling the supply and exhaust of the operating medium to and from only one side of each piston the other side of said pistons being exposed to the atmosphere.

A further object of the invention is to provide a construction employing double cylinders and connected pistons, and as associated means for efficiently cushioning or regulating the piston movements, such associated means being actuated by the pistons, or parts operated by them.

Other objects of the invention will appear more fully hereinafter.

The invention consists substantially in the construction, combination, location and relative arrangement of parts, all as will be more fully hereinafter set forth, as shown in the accompanying drawing and finally pointed out in the appended claims.

Referring to the accompanying drawing, and to the various views and reference signs appearing thereon Figure 1 is a view in elevation of a door operating mechanism embodying the principles of my invention, parts being in section. Figs. 2, 3 and 4 are diagrammatic views illustrating the action of the pressure controlling and also the cushioning or speed regulating devices.

In the operation of doors or other closures, and particularly doors employed in street or other cars, by pressure operated devices, it is desirable that the pressure medium employed to operate the door should be applied to equal piston areas for operating the door in either direction so as to secure uniform action. It is also desirable to avoid the friction of piston rods working through stuffing boxes as well as the necessity of providing piston rod packing which, in practice, rapidly wears out by being cut by dirt or other accumulation on the piston rod, thereby causing an undesirable and objectionable leakage. In order to obtain these desirable objects I propose to employ a double cylinder arrangement, each cylinder being closed at one end and freely open to the atmosphere at the other end, with a piston operating in each cylinder, the pistons being connected together to operate in unison through the open ends of the cylinders. The operating medium is supplied to and exhausted from each cylinder only at the closed end thereof, and operates on only one face of each piston, the opposite face being exposed to the atmosphere through the open end of the cylinder in which it works. In this manner I not only avoid the friction of the piston rods working through stuffing boxes, and the attendant objections above noted, but I also am enabled to secure equal piston areas for the operating medium to work against in moving the door in either direction, and I also secure an effective application of the pressure medium to the entire area of each piston. By this arrangement I am also enabled to attach the door operating or moving connections at a point intermediate the cylinders instead of at the end of a piston rod as heretofore has been the case, thereby securing a steadier and smoother operation of the door. I also propose to associate with the piston mechanism, and in such manner as to be operated thereby, means for regulating and controlling the

piston movements and thereby cushioning such movements and controlling the speed thereof.

In the drawing A designates a door or other device to be moved, and B, an operating or moving arm having suitable connection to the door whereby when said arm is rocked the door is moved. I have shown a single form of connection between the door and operating arm which well answers the purposes, and wherein the free end of the operating arm is pivotally connected to a slide C, operating along a rod D, secured to the door. Of course any other convenient form of connection may be employed, and therefore my invention, as defined in the claims, is not to be limited or restricted in this regard. The operating arm is connected to or formed with a segment gear 6, arranged to mesh with and to be rotatively moved by a rack 7. The arm B, or the segment gear 6, is pivotally supported upon a stud 8, mounted upon a bracket or fixed support 9. The rack 7, forms a connection between the pistons 10, 11, respectively operating in cylinders 12, 13. In the particular form shown these cylinders are in line with each other though this is not essential. One end of each cylinder is open to the atmosphere while the other end is closed and means are provided for supplying an operating medium to the closed end of the cylinders. Where the cylinders are arranged in line with each other their proximate ends are open to the atmosphere and their remote ends are closed. In this manner each piston is open on one side to the atmosphere and on the other side to the operating medium when such medium is admitted to the cylinder in which such piston operates.

Reference sign E, designates a casing in which is located the valve mechanism for controlling the supply and exhaust of operating medium to and from the cylinders. In Figs. 2, 3 and 4 I have illustrated diagrammatically the arrangement and operation of the valve in the valve casing and the ports controlled thereby. The valve 14, is in the form of a segmental disk and operates over a surface or seat 15, in which are the operating medium supply port 16, the ports 17 and 18, respectively communicating with one end—in this case the remote ends—of the cylinders 12, 13, and the exhaust port or ports 19, 20. On its under surface the valve 14, is provided with a recess or chamber which is enlarged or wide at each end thereof, as indicated at 21, 22, and narrow intermediate said enlarged parts, as indicated at 23. The valve 14, is rotatively actuated within the casing, in the embodiment of my invention shown, by means of a stem 24, which extends through the top of the casing E, and which may be rocked in any suitable or convenient manner, and from any convenient point, as, for instance, by means of a hand lever 25, and conveniently arranged intermediate connections 26.

While I have shown and described a specific form of valve construction and operating mechanism therefor, my invention, as defined in the claims, is not to be limited or restricted to the particular form shown and described, as many other specifically different constructions and arrangements may well answer the same purposes, without departure from the spirit and scope of my invention.

In the particular form shown, and referring to Fig. 2, it will be seen that the valve is in position to open the supply port 16, to the port 18, while the ports 17 and 19 and 20, are fully open to each other. Under this arrangement the operating medium is being supplied to the closed end of cylinder 13, while the closed end of cylinder 12 is freely open to exhaust.

In Fig. 3 the valve is in position to open ports 16 and 17, to each other, and to open port 18 to the ports 19 and 20, thereby admitting the operating medium to the closed end of cylinder 12, and opening the closed end of cylinder 13 to exhaust.

It is desirable to provide means for regulating and controlling the movements of the operating pistons 10, 11, to the end that the door may be brought gently to the limit of its movement in either direction, thereby avoiding undue slam or jar. To accomplish this result I employ means actuated by the pistons, or by parts operated, for effecting such control. This idea may be embodied in a wide variety of means. In the form shown I provide for an auxiliary reverse movement of the valve as the door approaches the limit of its movement in either direction, such auxiliary reverse movement being of sufficient extent to cause the narrow part 23 of the recess in the face of the valve to be brought over the exhaust ports 19, 20, thereby closing exhaust 19, but leaving exhaust port 20 uncovered. At the same time the port which supplies pressure to the operating side of the connected pistons remains fully open. The exhaust ports 19, 20 are of different sizes, the port 19, being the larger, so that when said port is closed the exhaust is required to pass only through the port 20 of restricted area, thereby regulating the speed of the door movement, and reducing the same so as to prevent the door from slamming. In Fig. 4, I have shown the valve in its speed regulating position. This regulating auxiliary reverse movement of the valve may be effected from a moving part of the door operating mechanism in any suitable or convenient manner. I have shown a simple arrangement wherein a cam 30, is arranged to move with the segment gear 6,

and to rock a movable yoke 31, which is connected by a link 32, or other connection, to the valve stem 24.

In its broadest scope my invention, as defined in the claims, is not to be limited or restricted to the means employed to secure the speed regulation of the door movements, the only essential being that the speed of the door movements is regulated by means operated from or by the door moving mechanism.

Having now set forth the object and nature of my invention and a construction embodying the principles thereof, what I claim as new and useful and of my own invention, and desire to secure by Letters Patent is:

1. The combination, in a pneumatic operating mechanism for doors or other devices, of an element to be moved, a motor, a valve arranged to control the supply of pressure medium to, and its exhaust from, said motor, means for shifting the valve into position to open the motor on one side to full supply of pressure, and on the other side to full exhaust, to initiate the operation of the motor, a pivotally mounted rocking member connected to the valve, a cam operated by the motor and arranged to engage said member to rock the same in reverse direction to that of its initial movement, to shift the valve into position to reduce the exhaust area to a constant predetermined area without substantially affecting the pressure supply to the motor, as the motor approaches the limit of its action, and devices operated by the motor for moving the movable element.

2. The combination in a pneumatic operating mechanism for doors or other devices, of an element to be moved, a motor, an arm connected to movable element and arranged to be actuated by the motor, said arm having a cam, a pivotally mounted yoke arranged to engage the cam and to be rocked thereby, a valve to which said yoke is connected, said valve arranged to control the supply of pressure medium to and its exhaust from the motor, and devices independent of the yoke for shifting the valve into position to open the motor on one side to full supply of pressure and on the other side to full exhaust to initiate the operation of the motor, said cam operating to reversely move the valve into position to reduce the area of exhaust opening from the motor without substantially affecting the pressure supply to the motor, as the motor approaches the limit of its stroke.

In testimony whereof I have hereunto set my hand in the presence of the subscribing witnesses, on this 19th day of April A. D., 1909.

HAROLD ROWNTREE.

Witnesses:
M. H. MARTIN,
L. M. SHIELDS.